

Analytical Studies Branch

**THE GENDER EARNINGS GAP AMONG
RECENT POSTSECONDARY GRADUATES,
1984-92**

by
Ted Wannell, Nathalie Caron

No. 68

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Explanation of Symbols

The data presented in this paper originate from a sample survey and are therefore estimates of the target population figures. In general, the variability of the estimates increases as the sample size decreases. The relative variability of an estimate is measured by the coefficient of variation. Statistics Canada publication guidelines prohibit the publication of estimates with a coefficient of variation greater than 33 percent. In tables, these estimates are replaced with the symbol "..". Estimates with a coefficient in the range of 16.5 to 33 percent are published with a cautionary asterisk (*), denoting their relatively high variability.

Abstract

This study attempts to compare the earnings of men and women on an equal footing by concentrating on recent postsecondary graduates and using survey data on a number of earnings-related characteristics. The data cover three graduating classes of university and community college students: 1982, 1986 and 1990. These data indicate that the gender earnings gap among graduates has narrowed in recent years. In fact among the most recent class, we found that female university graduates are rewarded slightly better than their male counterparts after controlling for experience, job tenure, education and hours of work. A small gender gap persists among community college graduates: about three-and-a-half percent on an hourly wage basis. For all graduates, the earnings gap tended to increase with age, even after controlling for previous work experience.

Key Words: earnings, wages, earnings gap, gender, discrimination, employment equity, graduates, university, community college



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TABLE OF CONTENTS

Highlights	1
Introduction	3
The Three Graduating Classes	5
Trends in the Gender Earnings Gap	11
Modelling The Gender Earnings Gap.....	17
Summary	31
Appendix I: Variable Definitions for Multivariate Analysis	33
Appendix II: Industry and Occupation Coding	36
Appendix III: Earnings by Field of Study.....	37

LIST OF CHARTS

Chart 1. Earnings by Hours of Work in 1992	27
Chart 2. Earnings by Age in 1992	29
Chart A1. University Graduates Earnings by Field of Study (1984)	37
Chart A2. University Graduates Earnings by Field of Study (1987)	37
Chart A3. University Graduates Earnings by Field of Study (1988)	38
Chart A4. University Graduates Earnings by Field of Study (1991)	38
Chart A5. University Graduates Earnings by Field of Study (1992)	39
Chart A6. College Graduates Earnings by Field of Study (1984)	40
Chart A7. College Graduates Earnings by Field of Study (1987)	40
Chart A8. College Graduates Earnings by Field of Study (1988)	41
Chart A9. College Graduates Earnings by Field of Study (1991)	41
Chart A10. College Graduates Earnings by Field of Study (1992).....	42

LIST OF TABLES

Table 1. Percentage of University Graduates by Field of Study and Degree Level	6
Table 2. Percentage of Community College Graduates by Field of Study	8
Table 3. Female/Male Earnings Ratios by Field of Study, Degree Level, Industry and Occupation for University Graduates	12
Table 4. Female/Male Earnings Ratios by Field of Study, Length of Program, Industry and Occupation for Community College Graduates.....	14

Table 5.	Regression Results " Explained Component" of Earnings Gap for University Graduates	19
Table 6.	Regression Results - Difference in Earnings Due to Residual Component for University Graduates	20
Table 7.	Significant Female Interactions (University Graduates).....	21
Table 8.	Regression Results - "Explained Component" of Earnings Gap for Community College Graduates	23
Table 9.	Regression Results - Difference in Earnings Due to Residual Component for Community College Graduates	23
Table 10	Significant Female Interactions (College Graduates)	25

HIGHLIGHTS

University Graduates

In each of the three graduating classes covered by this study -- 1982, 1986 and 1990 -- women earned more than half of the degrees granted. The proportion of degrees received by women increased over the period, from 51 percent in 1982 to 55 percent in 1990. Although women are receiving an increasing share at each degree level, female representation drops at each successive level. In 1990, for example, women earned well over half of the undergraduate degrees, just less than half at the masters level and about a third of the PhDs.

Most fields of study retain a male or female flavour. While the numbers of women are increasing in many traditionally male fields, especially the liberal professions, few still graduate from engineering and physical sciences fields. Instead, women tend to be concentrated in nursing and public health, most social sciences, education and the fine and applied arts.

On average, female graduates earned less than men in each class, but the gap shrank over time: women earned 13 percent less than men in 1984, nine percent less in 1992. The earnings gap shrank in most fields of study, industries and occupations. Within each class, women with PhDs earned as much as similarly qualified men.

For the class of 1982, the earnings gap grew significantly over their first five years in the labour market. For the class of 1986, the earnings gap was basically the same two years and five years after graduating.

Multivariate models are used to determine the extent to which men and women are rewarded differently in the labour market. Overall, differences in the reward structure for men and women grew from 1984 to 1988 and then shrank between 1988 and 1992. The multivariate models highlighted the importance of accounting for differences in the hours of work of men and women. Looking only at full-time workers, women worked an average of almost three hours less per week than men. Thus the **hourly wage gap** is considerably smaller than the **yearly earnings gap**. In fact, women in the class of 1990 earned higher average hourly wages than men.

Community College Graduates

Women comprise the majority of community college graduates, accounting for at least 55 percent of each graduating class. Women and men tend to be concentrated in different community-college fields of study -- men in the technology-based fields, women in applied arts, humanities and nursing.

The gender earnings gap is larger for community college graduates than for university graduates, but also diminished over time. On average, women earned 16

percent less than men in 1984 and 10 percent less in 1992. The earnings gap shrank in most fields of study, industries and occupations.

Within the graduating classes of 1982 and 1986, the earnings gap grew over time. Among 1982 community college graduates, the gap increased from 16 percent in 1984 to over 21 percent in 1987. Among the class of 1986, the gap went from 13 percent in 1988 to 20 percent in 1991.

In contrast to the university graduates, the earnings model indicated that the reward structures for male and female community college graduates converged from 1984 to 1988, but then diverged in 1992. Moreover, at each timepoint, the gender differences were greater among community college graduates than university graduates. So even though the overall earnings gap was shrinking for community college graduates, the model results indicate that it would have been shrinking faster if women were rewarded similarly to men.

The earnings model did point out a major similarity between the community college and university graduates: the number of hours worked is a major contributing factor in the earnings gap. Among full-time community college graduates, women worked an average of four hours per week less than men. So again the earnings gap -- about 10 percent -- is greater than the wage gap -- about three-and-a-half percent.

1. INTRODUCTION

Every year with the release of the statistics on the earnings of men and women¹, people wonder whether the small increase in the female-to-male earnings ratio truly reflects change in the labour market. Others wonder whether the overall ratio is meaningful, citing the influence that education, experience and other attributes may have on the earnings gap. Among the entire work force and using standard sources of data, it is difficult to compare the earnings of men and women on an equal footing. In this report we focus on the earnings of men and women in a very narrowly defined population -- recent graduates of Canadian universities and community colleges -- with data on many important earnings-related characteristics.

This analysis is made possible by a series of surveys covering particular graduating classes at particular times in their early careers. The National Graduates Surveys of 1984, 1988 and 1992 cover the graduating classes of 1982, 1986 and 1990. In addition, the classes of 1982 and 1986 were re-interviewed in 1987 and 1991, yielding a five-year perspective on their experiences. As well as estimates of earnings, the surveys gather a wealth of information on education, training, personal characteristics and early labour market experiences. We use these data to track the female presence in the graduating classes over time, compare the earnings of men and women by various characteristics and construct a model of earnings that attempts to control for the differing characteristics of men and women.

This study builds upon an earlier report that covered only the graduating class of 1982.² Although we have included comparable data for that cohort wherever possible, it may be useful to summarize the results of the earlier study. Overall, the gender earnings gap among graduates was smaller than among the work force at large. In 1982, the gap stood at 13 percent for full-time working university graduates and 16 percent for community college graduates. For both groups, the earnings gap increased between 1984 and 1987. Earnings models estimated that only a third of the gap for university graduates and a fifth of the gap for community college graduates could be attributed to the differing characteristics of men and women.

In general, the new data demonstrate that the gender earnings gap has been shrinking among recent graduates. In 1992, the gap stood at nine percent for university graduates and 10 percent for community college graduates. Equally important, new questions on the surveys of the classes of 1986 and 1990 point out the weakness of one of the major assumptions made in the earlier earnings model: that limiting the model to full-time workers would adequately control for hours worked. The more recent surveys indicated that full-time men worked an average of three to four hours more per week than full-time women. With hours added, the university earnings model estimates that women are rewarded about the same as men in the labour market. For community college

¹*Earnings of men and women*. Statistics Canada Catalogue 13-217.

²Wannell, Ted. *The Persistent Gap: Exploring the Earnings Differential Between Recent Male and Female Postsecondary Graduates*. Analytical Studies Branch Research Paper Series, No. 26. Statistics Canada, 1989.

graduates, the difference in hours worked explained some of the earnings gap but differing returns to age were even more important.

2. THE THREE GRADUATING CLASSES

The National Graduates Surveys employed in this study cover the graduating classes of Canadian university and colleges for the years 1982, 1986 and 1990. Although the NGS program also covers trade and vocational schools, they are not included here since many trades remain heavily dominated by one sex or the other. Thus it is hard to compare the earnings of men and women on an equal footing. This is also a problem with the community college data, but the greater numbers of graduates involved usually allow for statistically valid comparisons.

One thing that should be kept in mind when comparing surveys taken at different points in time is that the economic climate can change quite quickly. While it is not always clear how changing economic conditions might differentially affect the economic fortunes of men and women, the overall effects on graduates cannot be ignored.

The class of 1982 graduated into the deepest recession since the 1930s. While the economy recovered fairly quickly, youth unemployment did not drop to its pre-recession level until 1986. Even as unemployment dropped, the wages of young people remained low relative to other workers. Thus the class of 1986 faced better employment prospects, but reduced earnings relative to earlier graduates. The expansion of the 1980s was beginning to fade when the class of 1990 received their degrees and diplomas. The economy fell into a relatively shallow but protracted slump and had not improved significantly by the time of the 1992 survey.

While the economic upheavals in this period had consequences for postsecondary graduates, things were far worse for young people with lower levels of education. Thus greater numbers of young people stayed in school, ballooning the number of graduates over this period. Between 1982 and 1990, the number of university graduates increased by 29 percent and the number of community college graduates increased by almost 70 percent. These increases are remarkable given that the size of the age groups normally associated with postsecondary attendance actually shrank over this period.³ As we show in the following tables, the increase in graduates has been greater among women than men -- even though women were already in the majority among graduates by 1982.

In the tables that follow, the three columns on the left show the total number of graduates within each class and the proportion of the total that graduated from each field and level of study (i.e. the numbers sum to 100 percent). The three columns on the right list the total number of women in each class and the percentage of women **within** each field or level.

³Between 1982 and 1990 the population aged 20-24 shrank by over 15 percent, while the population aged 20-29 shrank by 5 percent. *Postcensal annual estimates of population by marital status, age, sex and components of growth for Canada, provinces and territories*. Statistics Canada Catalogue 91-210.

TABLE 1. PERCENTAGE OF UNIVERSITY GRADUATES BY FIELD OF STUDY AND DEGREE LEVEL

	All			Women		
	1982	1986	1990	% Within 1982	Each Field 1986	and Level 1990
TOTAL	97,314	119,916	125,745	49,631	64,699	68,936
TOTAL (%)	% 100.0	% 100.0	% 100.0	% 51.0	% 54.0	% 54.8
Field of Study						
Education	19.6	19.1	19.9	67.7	65.3	67.0
Fine Arts	2.5	3.3	2.3	66.0	67.5	65.8
Applied Arts	0.8	0.5	0.8	74.1	64.9	61.6
Journalism	0.5	0.2	0.3	69.6	72.3	63.9
Other Humanities	12.2	10.9	11.7	63.4	63.7	62.9
Sociology, Anthropology, Demography	3.3	3.0	4.1	71.2	77.5	76.0
Criminology	0.2	0.4	0.4	66.3	62.3	56.6
Law	3.3	2.7	3.0	44.9	49.1	47.7
Economics	3.6	3.1	3.2	21.4	33.4	26.9
Geography & Environment	2.7	2.5	2.2	37.0	38.6	37.4
Political Science	2.5	2.4	3.0	40.2	46.3	40.1
Psychology	5.1	5.5	6.2	70.9	80.8	75.5
Other Social Sciences	16.3	17.9	16.5	41.7	48.1	50.9
Agriculture	1.2	0.9	0.8	36.6	36.9	35.0
Biochemistry, Biology, Zoology	3.3	3.5	4.2	46.7	45.6	54.1
Home Economics	0.8	0.6	0.8	94.3	94.0	89.8
Veterinary	0.3	0.2	0.3	44.0	50.6	59.0
Architecture	0.5	0.4	0.3	16.3	30.4	31.0
Engineering	7.7	7.0	6.7	9.8	10.7	14.6
Forestry	0.5	0.4	0.2	24.4	19.9	13.5
Landscape Architecture	0.2	0.0	0.3	42.5	38.6	38.1
Dentistry	0.6	0.5	0.4	22.6	30.6	40.3
Medicine	2.5	2.4	2.0	40.5	45.7	42.9
Nursing	2.1	2.8	2.3	98.0	95.9	95.0
Optometry	0.1	0.0	0.1	67.4	62.1	54.1
Pharmacy	0.8	0.5	0.7	63.1	61.2	65.5
Public Health	0.1	1.0	0.2	65.6	82.6	67.0
Computer Science	1.9	3.0	2.0	23.7	33.2	19.6
Mathematics	1.6	1.7	1.8	32.4	37.0	37.2
Chemistry, Geology, Metallurgy	2.6	2.4	2.7	55.5	52.9	59.3
Meteorology	0.0	0.0	0.0	9.3	22.9	13.2
Physical & Other Sciences	0.6	0.7	0.7	7.0	7.5	13.2
Degree Level						
Bachelor's Degree	85.0	87.3	85.6	52.7	55.3	56.2
Master's Degree	13.5	11.7	12.8	42.9	45.3	48.4
Doctorate	1.5	1.0	1.7	27.4	34.3	35.5

Women received 51 percent of all university degrees granted in 1982, with the female share increasing to almost 55 percent by 1990. While the percentage of women drops with each step up in degree level, female representation increased at all degree levels. Women received nearly half of the masters degrees granted in 1990 (48 percent), up from 43 percent in 1982. Women remain substantially underrepresented at the doctoral level -- earning just over a third of the PhDs in 1990 -- but the female share had increased by eight percentage points since 1982.

Most fields of study retain a male or female flavour, even though there has been more blending of the genders in recent years. The proportion of women has been increasing in many traditionally male fields -- physics, meteorology, engineering, architecture and dentistry, for example -- yet remains comparatively small. The proportion of women bounced up and down in economics and computer science, and fell in forestry.

Women are more concentrated in nursing, home economics, most social sciences (sociology/anthropology/demography and psychology), public health, education, journalism and fine arts and applied arts.

The mix of men and women is relatively equal in some of the fields that lead to high-paying jobs: law, medicine, optometry and, increasingly, dentistry.

**TABLE 2. PERCENTAGE OF COMMUNITY COLLEGE GRADUATES BY
FIELD OF STUDY**

	All			Women		
	1982	1986	1990	% Within 1982	Each Field 1986	of Study 1990
TOTAL	53,362	73,920	90,482	30,929	40,518	51,009
TOTAL (%)	% 100.0	% 100.0	% 100.0	% 58.0	% 54.8	% 56.4
Field of Study						
Arts	0.0	1.8	1.3	77.3	50.7	64.4
Fine Arts	2.2	1.6	0.8	71.3	66.1	56.0
Promotional or Commercial Arts	1.0	1.2	0.7	73.1	60.5	63.3
Graphic or Audio-Visual Arts	2.0	1.7	1.9	43.1	47.5	56.4
Mass Communications	1.1	1.3	1.3	41.6	32.9	41.6
Other Applied Arts	2.1	1.1	2.2	75.2	86.1	89.3
Journalism	0.4	0.3	0.4	56.2	38.5	57.5
Library Sciences	0.9	1.9	0.5	88.8	62.5	83.0
Other Humanities	0.0	0.4	0.2	100.0	68.8	94.3
Nursing	12.0	10.4	10.0	94.2	88.6	89.5
Medical Technologists	5.3	4.5	4.7	80.0	81.0	79.8
Medical Equipment Technologists	0.1	0.4	0.3	37.2	65.8	55.2
Other Health	0.8	0.7	1.5	82.3	66.4	85.0
Chemical Technologies	1.2	9.0	0.9	39.8	47.2	43.0
Electrical & Electronical Tech.	6.8	6.4	5.6	4.8	5.2	10.3
Math & Computer Science	4.6	5.5	4.3	49.0	39.7	36.7
Transportation Tech.	0.8	0.4	0.7	14.2	24.6	8.0
General Engineering Tech.	3.5	3.1	3.0	12.2	10.5	15.9
Mechanical Engineering Tech.	3.1	2.5	6.2	1.3	3.8	4.5
Architectural & Construction Tech.	3.2	2.0	4.9	15.9	13.3	15.6
Industrial Engineering Tech.	1.3	1.1	2.1	9.7	8.6	12.7
Agriculture	2.3	2.0	1.6	45.4	45.0	55.2
Primary Industry Tech.	1.5	1.2	0.9	10.2	13.5	12.3
Processing Industry Tech.	1.1	0.3	0.8	16.0	19.9	18.4
Environment & Conservation	0.7	0.9	0.8	29.2	21.2	17.9
Protection & Correctional Services	2.3	2.5	3.2	30.9	34.1	39.4
Social Services	2.9	3.1	5.0	83.7	83.7	87.9
Sports & Recreation	2.1	2.0	2.1	79.4	64.9	73.6
Other Social Sciences	4.7	5.1	4.3	87.3	81.6	88.9
Management & Administration	25.2	21.6	22.4	71.9	68.3	74.4
Merchandising and Sales	3.3	2.8	2.5	51.2	52.3	51.3
Services	1.4	1.1	2.8	57.8	56.5	50.8
Miscellaneous	0.0	0.0	0.0	0.0	0.0	50.3

The number of community college graduates grew by two-thirds between 1982 and 1990. While women outnumbered men in each graduating class, the proportion of female graduates was highest in 1982 at 58 percent.

The field of study patterns differ greatly for men and women -- most fields have large majorities of one sex or the other. Men tend to form the majority in technology-based fields: mechanical engineering technologies, electric and electronic technologies, industrial engineering technologies, general engineering technologies, primary industry technologies, processing industry technologies, transportation technologies, architectural and construction technologies and environment and conservation. There are some exceptions to this rule. Women comprise the majority of graduates in medical technologies and over 40 percent in chemical technologies.

Aside from nursing and medical technologies, most of the predominantly female fields are in the social sciences and humanities: social services, other social sciences, library sciences, other humanities, other applied arts, sports and recreation and management/administration.

The courses with more equal mixes of men and women are in the applied arts and service areas: fine arts; graphic arts; mass communication; journalism; and, service and sales.

The number of women graduating from community college computer science courses fell between 1982 and 1990 -- the same trend as observed for university computer science programs.

3. TRENDS IN THE GENDER EARNINGS GAP

The earnings ratio expresses the average earnings of women as a percentage of the average earnings of other graduates. If both groups earn the same, the ratio would be 100. If women earn less, the ratio will be less than 100; if more, greater than 100. In this section, earnings ratios by field of study, level of study, industry and occupation are presented. Readers interested in earnings levels for graduates of different fields can refer to the charts in Appendix III.

In the National Graduates Surveys, respondents estimate their yearly earnings based on working at the job they held in the reference week for an entire year. As is customary, we limit the earnings comparisons to full-time workers (i.e. those who worked more than 30 hours in the reference week) in order to partially control for differing hours of work for men and women. However, the surveys that collected information on usual hours of work -- 1988 NGS, 1992 NGS and 1991 Follow-up Of Graduates(FOG) -- show the weakness of this assumption. In these surveys, full-time men worked an average of two-and-a-half to four hours more per week than their female counterparts. **Thus, the yearly earnings gaps presented in this section overstate the underlying hourly wage gap.** Section 4 presents a more complete accounting of the effect of hours worked on the earnings gap.

While the question used to capture earnings is the same in each survey, the quality of response was not consistent. The surveys of 1988, 1991 and 1992 contained a number of responses at the extreme high and low ends of the earnings scale. By cross-checking these responses against industry, occupation and previous year income, we judged that nearly all values outside the range of \$5,000 to \$500,000 were coding or response error. As such, we excluded these out of range values from the tabulations for those years.

TABLE 3. FEMALE/MALE EARNINGS RATIOS BY FIELD OF STUDY, DEGREE LEVEL, INDUSTRY AND OCCUPATION FOR UNIVERSITY GRADUATES

	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
Total	86.9	86.7	91.0	81.1	86.0
Field of Study					
None / Unknown	88.0	90.0	97.9	80.2	81.4
Education	84.6	87.7	90.2	84.8	88.4
Fine Arts & Humanities	98.0	94.7	104.9	91.8	97.4
Commerce, Economics & Law	83.1	83.2	84.8	84.8	88.0
Other Social Sciences	89.2	85.8	95.9	85.2	92.6
Agricultural & Biological Sciences	90.0	86.1	93.3	80.8	84.3
Engineering	90.6	92.5	99.6	89.2	90.6
Medical & Other Health	67.9	61.4	82.8	54.4	58.5
Math & Physical Sciences	91.1	91.5	88.5	89.8	91.9
Degree Level					
Bachelors / 1st Prof.	89.1	87.7	93.0	81.0	85.0
Masters	84.9	88.5	90.1	83.1	89.7
Doctorate	101.7	97.4	99.4	99.8	108.7
Industry					
Primary Industries	76.4	78.9 *	85.4 *	72.5 *	91.4 *
Manufacturing & Construction	82.7	81.7	89.6	80.0	85.9
Transport, Communications & Utilities	84.5	86.5	80.7	86.2	87.2
Wholesale Trade	85.3	72.4	77.6	76.5	78.3
Retail & Consumer Services	82.5	74.6	97.9	77.9	82.5
Finance	74.5	85.0	78.7	73.0	81.2
Insurance & Real Estate	68.2	84.2	99.6	65.6	97.3
Education	92.1	93.6	97.6	91.6	94.8
Health	73.3	68.8	83.3	59.3	61.6
Welfare & Religion	88.8 *	96.2 *	91.1	93.4 *	102.2 *
Services to Business Management	81.9	87.4	78.6	82.2	86.4
Public Administration	83.7	85.2	92.5	87.3	88.1

For the most part, the earnings gap between female and male university graduates shrank from one graduating class to the next but grew within each class over time. Between 1984 and 1992, the female to male earnings ratio two years after graduation increased from 87 percent to 91 percent. Between 1987 and 1991 the ratio five years after graduation increased from 81 percent to 86 percent. Note that for the class of 1986, the two-years-after earnings ratio was slightly lower than for the class of 1982, but that gap grew by less than a percentage point over the next three years.

TABLE 3. FEMALE/MALE EARNINGS RATIOS BY FIELD OF STUDY, DEGREE LEVEL, INDUSTRY AND OCCUPATION FOR UNIVERSITY GRADUATES - Completed

	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
Occupation					
Managers	82.1	80.5	85.1	82.1	88.5
Managerial Related	87.3	89.1	87.0	84.8	85.0
Physical & Life Sciences	88.7	88.1 *	86.9	88.1	86.8
Architecture & Engineering	86.8 *	85.1	95.9	90.1	89.0
Math & Computer Science	91.5	93.6	94.9	90.8	95.8
Social Sciences & Religion	88.0	94.5	81.9	85.9	89.1
University Teaching	77.1	82.0	103.1	83.8	97.3
Other Teaching	92.9	94.5	96.1	93.0	95.1
Health Diagnosis	72.5	70.7	87.1	79.4	71.2
Nursing, Other Health	93.8	97.4	94.2	85.1	90.6
Arts & Recreation	90.7	80.7	100.4	86.4	100.2
Clerical	82.4	87.1	95.3	79.2	85.8
Sales	72.1	79.9	77.4	66.8	87.6
Service Occupations	83.8	68.6	94.3	79.1 *	74.1 *
Blue Collar	90.0	66.5 *	85.4	74.2 *	71.8 *

The earnings gap tends to get smaller at higher degree levels, although the two-years-after gap is larger for masters than bachelors graduates in 1984 and 1992. There is virtually no earnings gap at the doctoral level. At the undergraduate level -- which comprises the vast majority of graduates -- the two-years-after gap closed from 89 percent to 93 percent and the five-years-after gap from 81 to 85 percent.

Between 1984 and 1992, the gender earnings gap shrank for graduates of all major fields of study except mathematical and physical sciences. The gap is shrinking rapidly in the medical and health fields as more and more women enter the diagnostic professions (e.g. dentistry, medicine and optometry), lessening the influence of their predominance in the lower-paying nursing field.

The overall trend to a smaller earnings gap is not evenly spread across industries and occupations. This probably has as much to do with the mix of graduates entering an industry or occupation as any differential treatment of men and women. In some industries -- most notably insurance and real estate -- the earnings gap has closed rapidly, while in several others the two-years-after gap has grown somewhat. Similarly, the earnings gap has disappeared in the occupations of university teaching and arts and recreation. The two-years-after gap grows somewhat in the physical and life sciences and in blue collar occupations. The five-years-after gap grows in several occupations, most notably health diagnosis. The differing two-years-after and five-years-after trends within a number of occupations point to the use of a multivariate model to better control for the many factors that can influence earnings (see Section 4).

TABLE 4. FEMALE/MALE EARNINGS RATIOS BY FIELD OF STUDY, LENGTH OF PROGRAM, INDUSTRY AND OCCUPATION FOR COMMUNITY COLLEGE GRADUATES

	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
Total	83.8	86.8	89.9	78.5	80.1
Field of Study					
Arts & Humanities	82.2	81.4	92.6	79.5	85.8
Health Sciences	82.7	83.2	89.0	79.3	77.7
Other Engineering Technology	86.3	81.6 *	92.2	81.9	81.0 *
Electronics, Math & Computer Science	90.5	104.3	95.5	88.8	89.1
Mechanical & Structural Engineering Tech.	94.0	97.0 *	97.0 *	86.4	88.2 *
Natural Sciences & Primary Industries	77.6	82.3 *	88.6	73.0	73.4 *
Social Sciences and Services	74.9	72.7	90.2	68.6	73.1
Secretarial Sciences & Merchandising	75.5	80.8	85.1	67.2	73.9
Management & Administration	79.7	79.3	78.6	76.5	76.3
Program Length					
3 -12 Months	77.2	92.6	84.2	77.1	84.6
13 Months - 2 Years	85.5	85.9	89.8	78.1	79.9
3 Years	84.5	88.8	96.2	78.4	81.6
4 Years and Above	70.1 *	67.7 *	76.7	104.9 *	62.7 *
Industry					
Primary Industries	69.9	79.0 *	83.9	65.2	56.3 *
Manufacturing & Construction	81.5	80.5	88.0	74.1	77.4
Transport, Communications & Utilities	75.3	76.1	88.4	74.6	80.0
Wholesale Trade	81.5	81.1	81.4	74.4	77.0
Retail & Consumer Services	77.0	84.8	86.1	75.8	82.8
Finance	79.7	81.4 *	87.1	76.1	76.5 *
Insurance & Real Estate	63.2	67.6 *	72.6	57.3	73.2 *
Education	83.8	87.0 *	74.9	82.1	86.8 *
Health	82.8	91.5	87.8	86.3	79.9
Welfare & Religion	108.3 *	..	95.8 *	116.4 *	..
Services to Business Management	78.3	87.7	83.4	78.9	77.1
Public Administration	82.3	79.1	84.7	81.2	80.8

As was the case with the university graduates, the female-to-male earnings ratio increased from graduating class to graduating class, but fell over time within each class. Between 1984 and 1992, the two-years-after-graduating ratio increased from 84 percent to 90 percent. The increase in the five-years-after ratio was more incremental -- inching up from 78.5 percent in 1987 to 80 percent in 1991.

TABLE 4. FEMALE/MALE EARNINGS RATIOS BY FIELD OF STUDY, LENGTH OF PROGRAM, INDUSTRY AND OCCUPATION FOR COMMUNITY COLLEGE GRADUATES - Completed

	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
Occupation					
Managers	81.2	76.2	83.6	78.7	76.5
Managerial Related	90.0	88.6	86.3	84.3	84.3
Physical & Life Sciences	90.0	77.0 *	92.0 *	89.0 *	87.5 *
Architecture & Engineering	87.4	87.8 *	89.6 *	84.7	89.2 *
Math & Computer Science	88.8	118.8	89.4	90.5	97.5
Social Sciences & Religion	86.3	92.5 *	104.8	85.4 *	89.5 *
University Teaching	..	..	..	..	..
Other Teaching	70.3 *	75.4 *	85.2 *	76.5	75.6 *
Health Diagnosis	..	..	..	..	..
Nursing, Other Health	90.1	99.1	88.7	93.3	93.0
Arts & Recreation	88.9	95.6	108.0	85.7	84.4
Clerical	83.0	93.0	90.1	78.6	85.3
Sales	71.9	81.0	79.9	62.6	73.6
Service Occupations	69.7	85.0	79.2	64.1	68.6
Blue Collar	78.7	82.1	88.2	71.8	73.0 *

The two-years-after-graduation earnings ratio increased from 1984 to 1992 in all but one of the major fields of study -- management and administration. The five-years-after ratio fell for graduates of three of the nine fields and did not exceed 90 percent in any field in 1987 or 1991.

The gender earnings gap for community college students is only weakly correlated to length of program -- the gap was generally smaller for graduates of longer programs. Although there is apparently a large earnings gap for graduates of four-year or longer programs, the numbers of graduates in this category is very small.

Both the level and the trend of the earnings gap for community college graduates vary widely by industry and occupation. Note that the earnings gap is widest for community college graduates in the same industries where it has disappeared for university graduates (insurance, real estate and education), re-emphasizing the importance of accounting for the many factors that affect the earnings gap.

4. MODELLING THE GENDER EARNINGS GAP

An individual's earnings are affected by a number of different factors, many of which are measured by the National Graduates Survey. Multivariate models are used to isolate the influence that each of a number of factors plays in a group's average earnings. A special construction of a multivariate model can be used to test the hypothesis that men and women are treated differently in the labour market.⁴

The model divides the difference between male and female average earnings into two components. The first is referred to as the explained or characteristics component. It captures the difference in earnings due to the differences in the earnings-related characteristics of men and women. For example, if more men graduate with advanced degrees or from high-earnings fields of study, they are expected to earn more and this difference is captured by the characteristics component. The larger the characteristics component, the greater the proportion of the earnings gap that can be explained by measured differences in the characteristics of men and women.

The second component, the coefficient or residual component, picks up differences in the way in which the characteristics of men and women are rewarded. For example, if men receive a higher premium for an advanced degree this discrepancy would contribute to the residual component. If a group is treated significantly worse for a number of different characteristics, the evidence of differential treatment gets stronger.

In the interpretation of the model, a certain number of conditions must be met to provide compelling evidence of labour market discrimination. In the list that follows we describe these conditions in lay and technical terms (in brackets).

1. A model that includes the possibility of differential rewards for women is better at explaining average earnings than a similar model that assumes equal returns for men and women. (An F-test for adding a designated group dummy variable and a full set of interaction terms is significant at the .05 level.)
2. The overall effect of the differential rewards for women -- the coefficient component -- is negative.
3. Net of all the other characteristics, there should be a negative effect associated with being female. (The designated group dummy variable should be negative and significant at the .05 level).

⁴The tests and rule outlined in this section are adapted from John D. Jackson and James T. Lindley, *Measuring the extent of wage discrimination: a statistical test and a caveat*. **Applied Economics**, 21, 515-540.

4. There should be some evidence of characteristics that are rewarded differently for which the most obvious explanation is discrimination. (There should be significant and negatively signed interaction terms that aren't easily attributable to other models of labour market behaviour.)

The first and second conditions are almost always met in the models we examined, while the third condition is almost never met. Therefore in the presentation of the results, we concentrate on the relative size of the two components and examine the significant interactions.

There are two dimensions of change displayed in each table in this section. The first is the time trend which moves from left to right and is subdivided according to whether earnings were modeled two or five years after graduation. The second dimension, moving from top to bottom (from the Base Model to the All Earners Model), involves moving from a narrower to a broader definition of the population in the model and from a less complete to a more complete set of characteristics.

The narrower population definition was imposed by the lack of information on the number of hours worked for the class of 1982 -- the surveys simply asked whether the graduate worked full- or part-time. Thus, the models were limited to full-time workers to ensure that roughly equal amounts of work were being compared. With the focus on full-time workers, we felt it was also appropriate to control for recent experience in full-time work. Thus the population was further limited to those who had worked full-time at each of the points covered by the surveys.

We add weekly hours to the models for the classes of 1986 and 1990 to test that assumption and found it to be quite weak.⁵ Depending upon the time of survey and type of institution, full-time women worked an average of between two-and-a-half and four hours less per week than full-time men. Thus hours of work contribute significantly to the explained component of the earnings gap, demonstrating that **the wage gap among graduates is smaller than the earnings gap**. We also felt that the 1986 and 1990 files enabled better calculation of current job tenure, which increases the explained component in most models.

With hours of work available, the population restrictions on part-time workers are lifted (the All-Earners models). In moving to models that included all workers it no longer made sense to control for demonstrated attachment to full-time work, especially with current job tenure in the model. Therefore, all workers with valid earnings data are included in these models.

As well as hours of work and tenure, the models include information on age, marital status, children, parents' education, home language, previous work experience,

⁵The econometrically trained will recognize an endogeneity problem which could result in biased estimates. In recognition of this possibility, the models were respecified as wage equations with no qualitative change in results.

field of study, level of degree or length of program, public sector employment, and region of residence. Detailed results are available upon request.

TABLE 5. REGRESSION RESULTS - "EXPLAINED COMPONENT" OF EARNINGS GAP FOR UNIVERSITY GRADUATES

Model (1)	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
	%	%	%	%	%
Base Model	48.5	27.2	45.1	43.6	30.7
- add hours	n/a	33.6	69.0	n/a	39.9
- add tenure	n/a	35.0	79.0	n/a	41.2
All Earners Model	n/a	49.9	104.1	n/a	54.3

(1) *Base Model is restricted to full-time earners who worked full-time at all surveyed time points. All Earners Model includes anyone with valid earnings for the reference week.*

The Base Model for university graduates traces a u-turn in the explained component of the earnings gap across successive classes. Nearly half of the 1984 earnings gap could be explained by the differing characteristics of men and women. That figure falls to just over a quarter in 1988 before climbing back to 45 percent in 1992. The drop in the explained component from the class of 1982 to the class of 1986 also showed up five years after graduation: the explained component fell from just under 44 percent in 1987 to just under 31 percent in 1991.

Adding hours of work and current job tenure greatly increases the explained component of the earnings gap for the class of 1992, but only marginally increases the explained component for the class of 1988. The largest boost to the explained component, however, comes from expanding the population to include all earners. With the expanded population, the explained component accounts for half of the earnings gap for the class of 1986 and all of the earnings gap for the class of 1992.

The large increase in the explained component from 1988 to 1992 across all models indicates that gender differences in the rewards for university graduates declined significantly in a short period of time.

TABLE 6. REGRESSION RESULTS - DIFFERENCE IN EARNINGS DUE TO RESIDUAL COMPONENT FOR UNIVERSITY GRADUATES

Model (1)	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
	%	%	%	%	%
Base Model	5.9	9.9	3.7	10.5	10.3
- add hours	n/a	9.1	2.1	n/a	9.0
- add tenure	n/a	8.9	1.4	n/a	8.7
All Earners Model	n/a	7.9	-0.4	n/a	8.5

(1) *Base Model is restricted to full-time earners who worked full-time at all surveyed time points. All Earners Model includes anyone with valid earnings for the reference week.*

This table shows the percentage difference in earnings attributable to differential rewards to characteristics. That is to say women are estimated to have earned 5.9 percent less in 1984 due to differential rewards in the labour market. Here again, note the increasing role of the residual component between 1984 and 1988, followed by a dramatic closing of the gap between 1988 and 1992.

Note that the residual difference in earnings diminishes with the addition of hours and tenure to the model and decreases further when the model is expanded to include all earners. In fact, the residual component turns negative in 1992. **This means that controlling for differences in characteristics, female graduates earned more than men.**

The question of which characteristics are rewarded differently is addressed in Table 7. Positive interactions (in bold) indicate characteristics for which women are rewarded relatively better than men; negative interactions point to characteristics for which women are rewarded relatively worse than men. The main point here is not to examine each significant interaction in isolation, but to look for patterns and changes over time.

One obvious pattern is that the number of significant negative interactions decreases over time indicating a general improvement for women across the period. In most of the models women receive lower relative returns to having children, but this effect disappears in the all earners models for 1988 and 1992. In the classes of 1982 and 1986 women tend to receive lower rewards for graduating from diagnostic specialties (e.g. Medicine and Dentistry), but this difference is absent from the 1992 models.

In terms of positive interactions, women receive consistently higher returns to working in the Public Sector and for graduating from Engineering programs. The Public Sector variable was entered in the model to account for the fact that public sector industries tend to be covered by employment equity legislation and this may well be what the positive female interaction term is capturing. One can only speculate that female engineering graduates earn consistent premiums due to their scarcity -- women comprised no more than 15 percent of engineering graduates in each of the classes.

TABLE 7. SIGNIFICANT FEMALE INTERACTIONS (UNIVERSITY GRADUATES)

MODEL	Two Years After			Five Years After		
	1984	1988	1992	1987	1991	
Base Model	Positive	FPARENTP FMARRIED FJOURNLS FOTHHUMA FPOLISCI FAGRIC FARCHTCT FPUBSECT	FFINEART FOTHHUMA FCRIMLGY FECONOMC FPOLISCI FENGINEE FPRFTLT1 FPRFT1_3 FPUBSECT	FFINEART FJOURNLS FOTHHUMA FCRIMLGY FENGINEE FPRFTLT1 FPRFT1_3 FPUBSECT	FFRENCH FOTHLANG FENGINEE FPHARMAC FMATH FMANSASK FPUBSECT	FFRENCH FGEOGENV FENGINEE FCOMPSCI FPHD FPUBSECT
	Negative	FCHILD84 FDENTIST FMEDICIN FPHYSETC FATLANTC FALBERTA FBCTERR	FDIVSEPW FDENTIST FMEDICIN FPRFT1_3	FCHILD92 FARCHTCT	FEMALE FCHILD87 FECONOMC FGEOGENV FPOLISCI FDENTIST FOPTOMTR FPUBHLTH	FAGRIC FMARRIED FCHILD91 FDENTIST FMEDICIN FOTHHLTH FBCTERR
- Add Hours	Positive	n/a	FFINEART FOTHHUMA FCRIMLGY FECONOMC FPOLISCI FENGINEE FCOMPSCI FMATH FPUBSECT	FFINEART FAPPLART FJOURNLS FOTHHUMA FCRIMLGY FENGINEE FPRFTLT1 FPRFT1_3 FPUBSECT	n/a	FFRENCH FGEOGENV FENGINEE FPHARMAC FCOMPSCI FPHD FPUBSECT
	Negative		FEMALE FSCHOOLP FDIVSEPW FDENTIST FMEDICIN FPRFT1_3	FCHILD92 FARCHTCT		FMARRIED FDENTIST FMEDICIN FOTHHLTH FBCTERR

See Appendix I. for definitions of all variable names.

TABLE 7. SIGNIFICANT FEMALE INTERACTIONS (UNIVERSITY GRADUATES) - Completed

MODEL	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
- Add Tenure Positive	n/a	FFINEART FOTHHUMA FCRIMLGY FECONOMC FPOLISCI FENGINEE FCOMPSCI FMATH FMANSASK FALBERTA FPUBSECT	FSCHOOLP FFINEART FAPPLART FJOURNLS FOTHHUMA FSOCANTH FCRIMLGY FHOMEEC FENGINEE FCOMPSCI FPUBSECT	n/a	FFRENCH FGEOGENV FENGINEE FPHARMAC FCOMPSCI FPHD
Negative		FEMALE FSCHOOLP FOTHERPR FDENTIST FMEDICIN FPRFT1_3 FTEN88	FPARENTP FCHILD92 FPHYSETC		FMARRIED FDENTIST FMEDICIN FOTHHLTH FBCTERR
All Earners Model Positive	n/a	FFINEART FOTHHUMA FLAW FECONOMC FGEOGENV FPOLISCI FBIOETC FENGINEE FPHARMAC FCOMPSCI FMATH FPUBSECT FHOURS88	FAGESQ FSCHOOLP FFINEART FAPPLART FJOURNLS FOTHHUMA FHOMEEC FENGINEE FPUBSECT FHOURS	n/a	FFRENCH FOTHLANG FFINEART FOTHHUMA FGEOGENV FENGINEE FPHARMAC FMATH FMASTERS FPRFTGT3 FPUBSECT FHOURS91
Negative		FOTHERPR FDENTIST FMEDICIN FPHYSETC	FAGE592 FOTHERPR FARHTCT FALBERTA		FEMALE FSCHOOLP FMARRIED FCHILD91 FDENTIST

See Appendix I. for definitions of all variable names.

Note that in the all earners models there are positive interactions for hours of work. This means that, all other factors being equal, female university graduates earn higher hourly wages than men.

TABLE 8. REGRESSION RESULTS - "EXPLAINED COMPONENT" OF EARNINGS GAP FOR COMMUNITY COLLEGE GRADUATES

Model (1)	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
	%	%	%	%	%
Base Model	8.3	16.5	-5.7	18.9	11.4
- add hours	n/a	29.8	5.9	n/a	24.7
- add tenure	n/a	31.8	10.9	n/a	26.4
All Earners Model	n/a	28.5	23.2	n/a	44.8

(1) *Base Model is restricted to full-time earners who worked full-time at all surveyed time points. All Earners Model includes anyone with valid earnings for the reference week.*

The results for community college graduates differ substantially from the university graduates. First, differences in the characteristics of male and female community college graduates account for a much smaller proportion of the overall earnings gap. Second, the explained component shrank between 1988 and 1992. Thus, differential rewards play a larger role in the earnings gap for community college graduates and the reward structures for men and women seem to have diverged in recent years.

TABLE 9. REGRESSION RESULTS - DIFFERENCE IN EARNINGS DUE TO RESIDUAL COMPONENT FOR COMMUNITY COLLEGE GRADUATES

Model (1)	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
	%	%	%	%	%
Base Model	17.5	12.4	11.8	20.2	18.5
- add hours	n/a	10.5	10.6	n/a	16.0
- add tenure	n/a	10.1	10.2	n/a	15.7
All Earners Model	n/a	12.9	12.1	n/a	12.4

(1) *Base Model is restricted to full-time earners who worked full-time at all surveyed time points. All Earners Model includes anyone with valid earnings for the reference week.*

The actual percentage difference in earnings attributable to differential rewards shrank over time. This was solely a result of the shrinkage in the overall earnings gap since, as noted above, the proportion of the gap attributable to the residual component increased.

As with the university graduates, the residual gap shrank with the addition of hours of work and tenure to the model. In contrast to the university graduates, the residual gap increased in two out of three models where the population was expanded to include all earners.

The growth of the residual gap is mirrored in the increasing number of significant negative interaction terms over time. While no variable is rewarded consistently worse for women across all models, some appear fairly frequently. Female community college graduates are estimated to have lower returns to working in British Columbia in most models. Marriage, age and the presence of children also tend to depress the earnings of women vis-à-vis the earnings of men in a number of models.

Female community college graduates earn a premium for working in the public sector in about half the models. The square of age also appears frequently among the positive interaction terms. The combination of a negative interaction for age and a positive interaction for age squared results in a flat estimate of earnings by age for female community college graduates.

The all earners models for 1991 and 1992 yielded positive interaction terms for hours worked. Thus female community college graduates in these years earned higher wages than men, after accounting for the effects of other variables.

**TABLE 10. SIGNIFICANT FEMALE INTERACTIONS
(COLLEGE GRADUATES)**

MODEL		Two Years After			Five Years After	
		1984	1988	1992	1987	1991
Base Model	Positive	FPROMOCO FGRAPHIC FAPPLART FJOURNLS FNURSING FCHEMTEC FELECETC FMATHCS FINDSTEN FPROTCOR FSOCSESV FMANAGAD FPRFTGT3 FPUBSECT	FOTHLANG FPROMOCO FAPPLART FJOURNLS FNURSING FELECETC FMATHCS FSERVICE	FEMALE FAGESQ FPARENTP	FPRFT1_3 FATLANTC FMANSASK FPUBSECT	FNURSING FMATHCS FARCHCNS FPRFTGT3 FPUBSECT
	Negative	FPARENTP FALBERTA	FSCHOOLP FKIDS88 FBCTERR	FAGE592 FMARRIED FPROMOCO FOTHHUMA FMEDTECH FATLANTC FALBERTA FBCTERR	FOTHHLTH FSOCSESV FSPORTRE	FSCHOOLP FMARRIED FKIDS91 FAGRIC
- Add Hours	Positive	n/a	FOTHLANG FPROMOCO FAPPLART FJOURNLS FNURSING FELECETC FMATHCS	FAGESQ FPARENTP	n/a	FARCHCNS FPRFTGT3
	Negative		FSCHOOLP FKIDS88 FBCTERR	FAGE592 FMARRIED FPROMOCO FOTHHUMA FMEDTECH FATLANTC FALBERTA FBCTERR		FSCHOOLP FMARRIED FKIDS91 FHOURS91

See Appendix I. for definitions of all variable names.

**TABLE 10. SIGNIFICANT FEMALE INTERACTIONS
(COLLEGE GRADUATES) - Completed**

MODEL	Two Years After			Five Years After	
	1984	1988	1992	1987	1991
- Add Tenure Positive	n/a	FOTHLANG FPUBSECT FAPPLART FJOURNLS FNURSING FELECETC	FAGESQ FPARENTP FHOURS	n/a	FEMALE FAGESQ FPRFTGT3 FPUBSECT
		FSCHOOLP FKIDS88 FBCTERR	FAGE592 FMARRIED FPROMOCO FOTHHUMA FATLANTC FALBERTA FBCTERR		FAGE91 FSCHOOLP FKIDS91 FMARRIED FHOURS91
All Earners Model Positive	n/a	FOTHLANG FFINEART FPRFT1_3 FPRFTGT3	FAGESQ FPARENTP FFINEART FPUBSECT FHOURS	n/a	FAGESQ FOTHLANG FPARENTP FNURSING FPRFTGT3 FPUBSECT FHOURS91
		FAGE588 FFRENCH FSCHOOLP FMARRIED FKIDS88 FCHEMTEC FMECHENG FAGRIC FPROTCOR FOTHSOCS FBCTERR	FAGE592 FMARRIED FPROMOCO FMEDTECH FCHEMTEC FMECHENG FPRMRYIN FPROTCOR FOTHSOCS FATLANTC FALBERTA FBCTERR		FAGE91 FMARRIED FKIDS91 FBCTERR

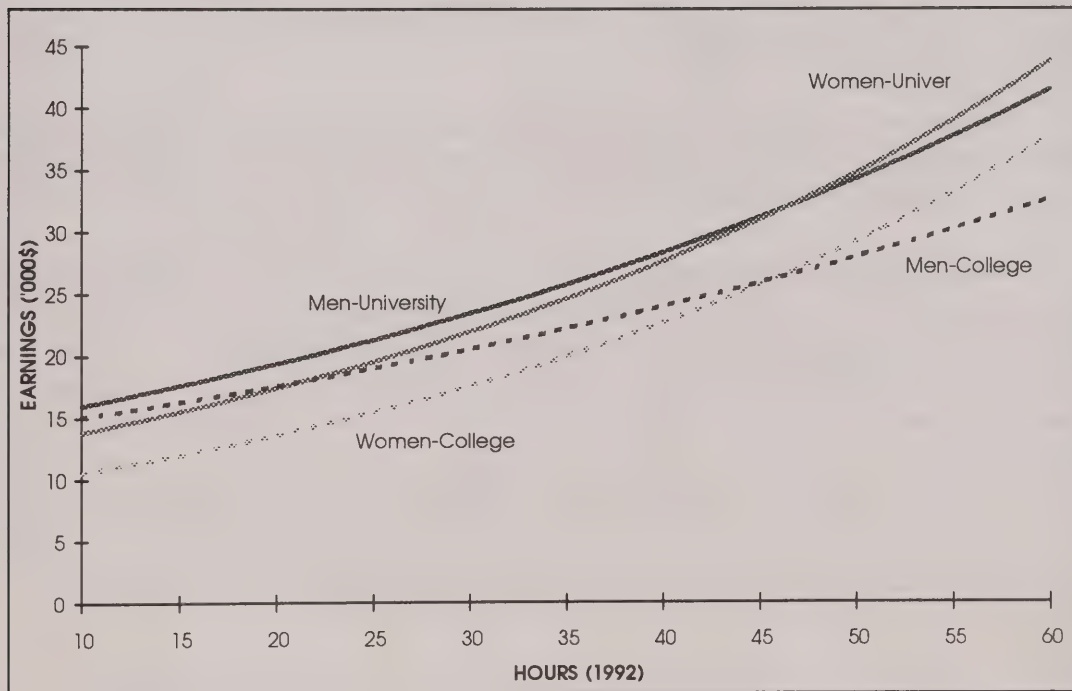
See Appendix I. for definitions of all variable names.

Do the models provide evidence of discrimination against women?

The models provide incontrovertible evidence that women interact differently with the labour market than men. However, it would be very tenuous to conclude that the differences are due to widespread discrimination against women. Keep in mind the four conditions introduced at the beginning of this section.

The first two conditions ask the questions: "Are women rewarded differently than men?" and "Is the net effect of these differences negative for women?". In every model except one the answer to both of these questions is "Yes."⁶, providing consistent evidence that female and male graduates interact differently with the labour market. However, the third condition -- a negative and significant intercept term -- is met only for two of the 1988 university models for full-time workers. But when the population is expanded to include all workers, women are estimated to earn higher wages all else being equal. This was also the case for almost every other "All Earners" model. Therefore, net of the effects captured by the model, women earned higher wages than men. Chart 1 illustrates this point for 1992.

CHART 1. EARNINGS BY HOURS OF WORK IN 1992



⁶The exception is the 1992 university all earners model. Here the rewards were estimated to be significantly different, with the net effect in the favour of women.

In this chart, all other factors are held at their average value, while hours and earnings are allowed to vary. Thus the female-to-male gap at the left hand side of the chart reflects the net effect of all other factors. Note that for both university and community college graduates, female earnings rise faster as more hours are worked -- illustrating the higher estimated wage rates. One important difference is that the initial gap for university graduates is almost entirely due to the differing characteristics of men and women, while the initial gap for community college graduates is primarily due to differing returns to characteristics. Since the models do not generally support the notion of widespread, systemic discrimination against women, interpretation of the earnings gap should be guided by differences in the reward structure estimated within the models.

The most basic form of discrimination involves a preference among employers and customers for dealing with members of one group over another.⁷ While the models refute the presence of widespread discrimination against women, they do not eliminate the possibility that a preference for hiring or dealing with men exists in some sectors or locations. The models revealed some patterns of differential rewards for men and women, but in each case it is hard to conclude that persistent discrimination is the only plausible explanation.

Among university graduates, we noted that female doctors and dentists were frequently estimated to earn less than men in these fields. This could indicate a public preference for dealing with male health professionals. However, note that this effect did not occur in any of the 1992 models. Thus any latent preference for male doctors and dentists appears to be diminishing.

We also noted that residing in British Columbia had a negative interaction effect for women in many of the models, particularly for community college graduates. It is hard to think of any feature of the west coast labour market that would account for this effect.

Being married or having children were also estimated to be differentially rewarded in a number of models. A model of "statistical discrimination" provides one interpretation of such results. Employers may perceive that married women or women with children are more likely to interrupt their careers and are therefore more willing to bet upon men or unmarried women.⁸ However, such a logic could well be extended to all young women and thus would be captured by the intercept term. On the other hand, labour supply decisions within the family context may favour a pattern of earnings maximization for men while women might place more importance on the ability to exit and re-enter a job. Such a pattern of decisions would be more limited to women who were married and/or have children, which seems a better description of the model results.

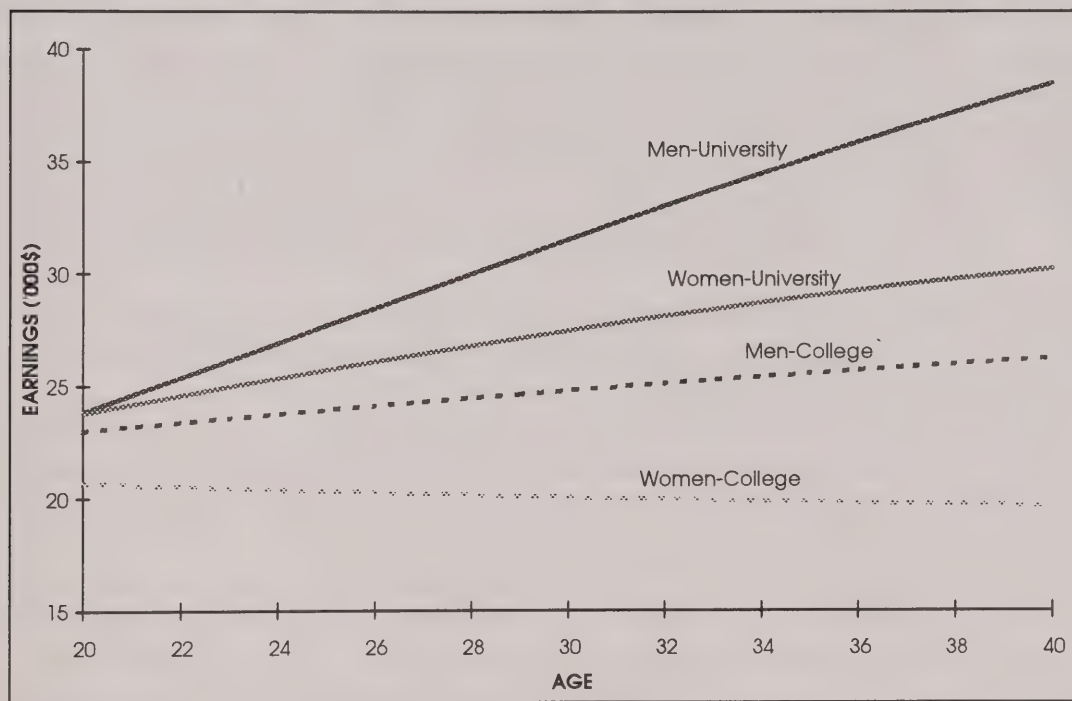
⁷Theoretically, customer preference is a necessary condition since employer-only discrimination would create a labour cost advantage for non-discriminating employers. The competitive process would then work the wage difference out of the system, unless customers were willing to pay a premium for dealing with the preferred group.

⁸See Lester Thurow, **Generating Inequality: Mechanisms of Distribution in the United States** (Basic, 1975), for a more complete discussion of statistical discrimination.

The result most difficult to explain is the differential returns to age, which was particularly strong among community college graduates (see Chart 2). Note that this chart should not be interpreted as a graduate's expected age-earnings profile, but rather an indication of the earnings gap between male and female graduates in different age groups. Thus the earnings gap is wider for older graduates.

One explanation is that the models might not be adequately accounting for previous work experience. The models contain four categories of previous full-time experience, the maximum being "three years or more". Given that such a high level of aggregation might be masking differences in the average amount of previous full-time experience, we reran the 1992 all-earners models using actual months of previous full-time experience.⁹ The model estimated that the returns to previous experience were not significantly different for men and women, while the results vis-à-vis age remained unchanged. The possibility remains that there may be differences in the quality of previous experience -- in terms of earnings, industry and occupation -- but cannot be tested with these data.

CHART 2. EARNINGS BY AGE IN 1992



Discrimination against older women is another possible explanation. As noted earlier, competitive forces should limit this type of discrimination to the extent that it is supported by public tastes. Furthermore, all but a handful of the graduates are under the age of 45 and therefore younger than what most people would qualitatively describe as old.

⁹The 1992 survey was the only one which collected the information at this level.

Another possibility is that the marriage and child variables only capture a portion of the true earnings-family relationship for women. Spousal income, for example, generally increases with age and may therefore place other priorities ahead of earnings in the wife's job. While no data is available on spousal income in the surveys, we can partially test this hypothesis by running separate models for single (never married) and married graduates only. The results were as expected for community college graduates -- the age difference was greater for married graduates -- but were just the opposite for university graduates. Thus the age effect has some interaction with both marriage and type of education, which weighs against any simple interpretation.

SUMMARY

In general, the National Graduates Surveys indicate that the postsecondary studies and subsequent labour market experiences of men and women are becoming more alike. However, the trends are not necessarily linear and the underlying factors are not always straightforward.

Women comprised the majority of university and community college graduates in each of the classes studied: 1982, 1986, and 1990. The representation of women appears to be levelling off at community colleges and climbing slowly at universities. Women are still underrepresented among advanced university degree holders, particularly at the PhD level, but the gap is steadily closing. Large differences remain in the field of study patterns of men and women, particularly at community colleges. While the numbers of women are increasing in many traditionally male fields, especially the liberal professions, few still graduate from most engineering and technology fields. Counter to the overall trend, the proportion of female computer science graduates is declining at both universities and community colleges.

In terms of earnings, the general pattern was for the gap between men and women to shrink from one class to the next, but to increase within each class over time. The university class of 1986 was the exception to both of these patterns. The earnings gap measured two years after graduation was fractionally larger than was found in the previous class and the gap grew less than a percentage point over the next three years. The earnings of women advanced relative to the earnings of men in almost all fields of study, and across most industries and occupations. In each graduating class, the earnings of women with PhDs were equal to the earnings of similarly qualified men.

A multivariate earnings model was used to further analyze the earnings gap. The model divides the earnings gap into two components: one which captures the difference in earnings due to the different characteristics of men and women (the characteristics or explained component); and a second which captures the proportion of the earnings gap attributable to differing returns to those characteristics (the residual component). The model yielded opposing trends for university and community college graduates. For university graduates, the proportion of the earnings gap due to differing characteristics shrank from 1984 to 1988, then increased sharply in 1992. For community college graduates, the characteristics component increased from 1984 to 1988 and then dropped in 1992. Furthermore, at every timepoint the explained component was larger for university graduates than for community college graduates.

The earnings model also showed the role that hours of work plays in the earnings gap. Even with the population restricted to full-time workers, women worked an average of two-and-a-half to four hours less per week than men. Thus the **wage gap** is smaller than the earnings gap for both university and community college graduates. But the addition of part-time workers to the earnings models highlighted another difference between the university and community college graduates: it increased the characteristics component for university graduates but not for community college graduates. As a result the earnings gap among all 1990 university graduates could be entirely attributed to the

differing characteristics of men and women, while none of the gap among community college graduates could be thus explained.

On the other hand, some important results were consistent for both university and community college graduates. For both groups the **wages** of women are higher than those of men when all other factors are held constant. This means that any salient negative factors for women are captured by the model. As noted above, the **net difference** falls almost entirely on the characteristics component for university graduates and almost entirely on the residual component for the community college graduates. However, age effects for women are similar for both types of graduates. The earnings (and wages) of female graduates change very little by age, while the earnings of men rise across most of the age range. This is not to say that the earnings profiles of men and women will differ across time, although that may well occur, but that the earnings gap is larger for older women vis-à-vis older men within each graduating class. Since the model accounts for differences in the amount of prior full-time work experience and the presence of children, the age effect is not merely acting as a proxy for these variables.

On the whole, it is hard to fall back on a single model of labour market behaviour that adequately explains the results outlined above. While the possibility of discrimination is not eliminated by the results, the models indicate that it is not of the widespread, systemic variety. Explanations related to child-bearing and joint labour supply decisions receive some support from the models, but do not account for much of the overall gap. Differences in the returns to age factor into most of the models, but do not directly support either interpretation.

APPENDIX I. VARIABLE DEFINITIONS FOR MULTIVARIATE ANALYSIS

intercep	intercept
age	age
agesq	age squared
english	home language is English (omitted variable)
french	home language is French
othlang	home language other than French or English
homepr	work province = original province (omitted variable)
schoolpr	(work province = school province) \neq original province
otherpr	work province \neq school province \neq original province
parentnp	neither parent postsecondary educated (omitted variable)
parentps	at least one parent had some postsecondary education
single	currently single (omitted variable)
married	currently married
divsepwi	currently divorced, widowed or separated
nochild	currently has no dependent children (omitted variable)
child	currently has dependent children
noprft	no prior full-time experience (omitted variable)
prftlt1	prior full-time experience: < 1 year
prft1_3	prior full-time experience: 1-3 years
prftgt3	prior full-time experience: more than 3 years
atlantic	currently resides in Atlantic Provinces
quebec	currently resides in Quebec
ontario	currently resides in Ontario (omitted variable)
mansask	currently resides in Manitoba or Saskatchewan
alberta	currently resides in Alberta
bcterr	currently resides in British Columbia or Territories
pubsect	works in public administration, health, education or welfare
privsect	works in private sector (omitted variable)
hours	hours of work per week
tenure	number of years of tenure

Variables Specific to Community College Graduates

arts	general arts (omitted variable)
finearts	fine arts
promocom	promotional or commercial arts
graphic	graphic or audio-visual arts
masscomm	mass communications
applarts	applied arts

Variables Specific to Community College Graduates (*continued*)

journalism	journalism
libsci	library sciences
othhuman	other humanities
nursing	nursing
medtech	medical technologists
medequip	medical equipment technologists
othhlth	other health-related programs
chemtech	chemical technologies
elecetc	electrical and electronic technologies
mathcs	math and computer sciences
transprt	transportation technologies
genrleng	general engineering technologies
mecheng	mechanical engineering technologies
archnst	architectural and construction technologies
indsteng	industrial engineering technologies
agric	agriculture
prmryind	primary industry technologies
prcssind	processing industry technologies
envcons	environment and conservation
protcorr	protection and correctional services
socserv	social services
sportrec	sports and recreation
othsocsc	other social sciences
managadm	management and administration
merchsal	merchandising and sales
service	personal services (restaurant, hotel, etc.)
oneyear	course length: 1 year or less
twoyear	course length: 2 years
threeyr	course length: > 2 years (omitted variable)

Variables Specific to University Graduates

education	education (omitted variable)
fineart	fine arts
applart	applied arts
journalism	journalism
othhuman	other humanities
socanthr	sociology and anthropology
crimlgy	criminology
law	law (professional degree)
economcs	economics

Variables Specific to University Graduates (*continued*)

geogenvr	geography and environmental studies
polisci	political science
psych	psychology
othsocsc	other social sciences
agric	agriculture
bioetc	biology, biochemistry, zoology
homeec	home economics
veternry	veterinary
archtct	architecture
engineer	engineering
forestry	forestry
dentist	dentistry
medicine	medical degree
nursing	nursing
optomtry	optometry
pharmacy	pharmacy
pubhlth	public health
othhlth	other health-related degrees
compsci	computer sciences
math	math, statistics
chemetc	chemistry, geology and metallurgy
metrlogy	meteorology
physetc	physical and other sciences
undergrd	undergraduate degree (omitted variable)
masters	earned masters degree
doctorat	earned doctorate degree

APPENDIX II.
INDUSTRY AND OCCUPATION CODING

<u>Industry Description</u>	<u>Standard Occupation Classification (1980)</u> <u>Codes</u>
Managers	1111 - 1158
Managerial Related	1171 - 1179
Physical & Life Sciences	2111 - 2139
Architecture & Engineering	2141 - 2169
Math & Computer Science	2181 - 2189
Social Sciences & Religion	2311 - 2519
University Teaching	2711 - 2719
Other Teaching	2731 - 2799
Health Diagnosis	3111 - 3119
Nursing, Other Health	3130 - 3169
Arts & Recreation	3311 - 3379
Clerical	4110 - 4199
Sales	5130 - 5199
Service Occupations	6111 - 6199
Blue Collar	7113 - 9599
Not Specified	Less than 1111 or 9910 - 9919

<u>Occupation Description</u>	<u>Standard Industrial Classification (1980)</u> <u>Codes</u>
Primary Industries	001 - 092
Manufacturing & Construction	101 - 449
Transport, Communications & Utilities	451 - 499
Wholesale Trade	501 - 599
Retail & Consumer Services	601 - 692 & 911- 999
Finance	701 - 729 & 741 - 749
Insurance & Real Estate	731 - 733 & 751 - 761
Education	851 - 859
Health	861 - 866
Welfare & Religion	867 - 869 & 981
Services to Business Management	771 - 779
Public Administration	811 - 841
Not Specified	Greater than 999

APPENDIX III. EARNINGS BY FIELD OF STUDY

CHART A1. UNIVERSITY GRADUATES EARNINGS BY FIELD OF STUDY (1984)

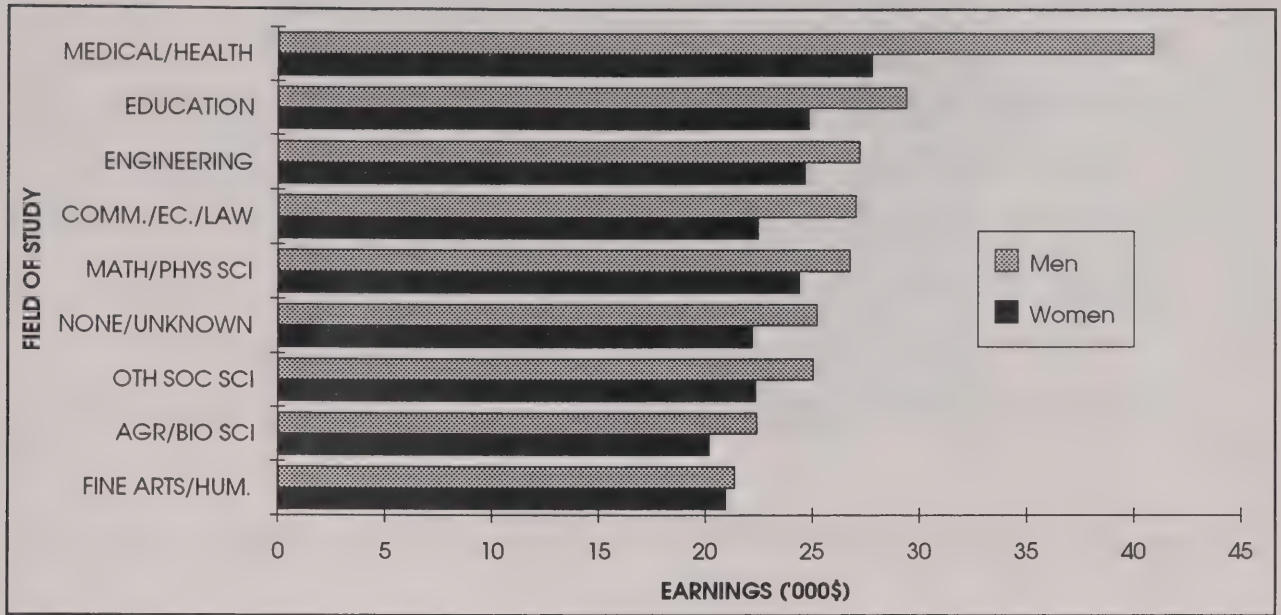


CHART A2. UNIVERSITY GRADUATES EARNINGS BY FIELD OF STUDY (1987)

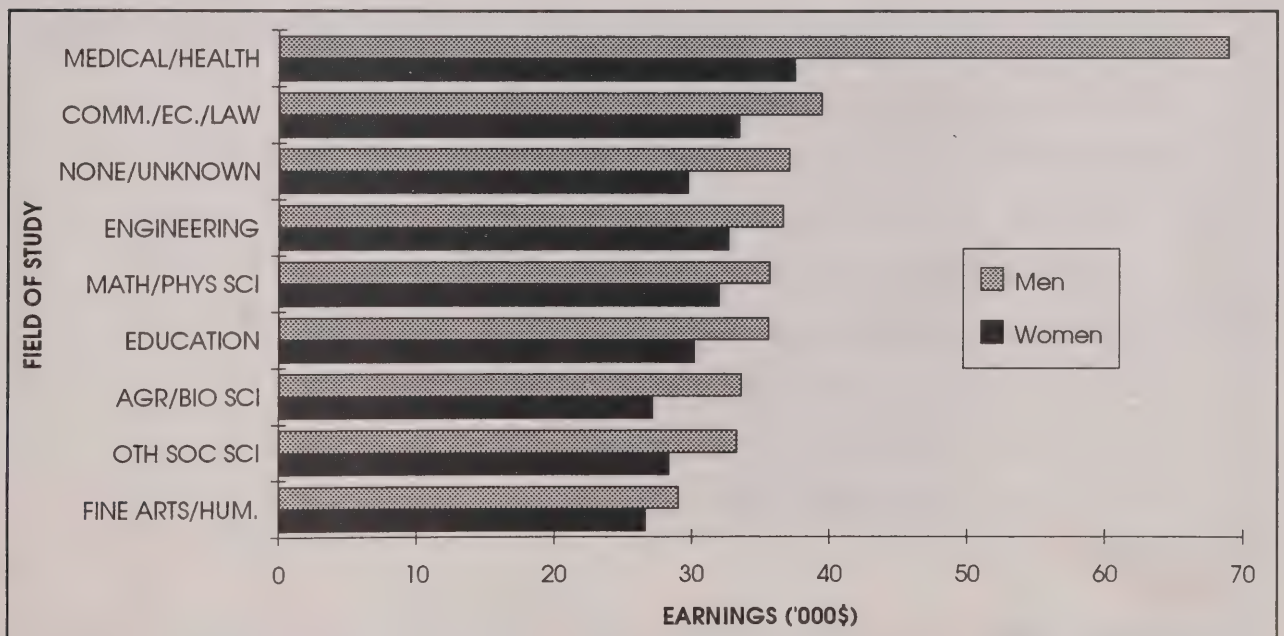


CHART A3. UNIVERSITY GRADUATES EARNINGS BY FIELD OF STUDY (1988)

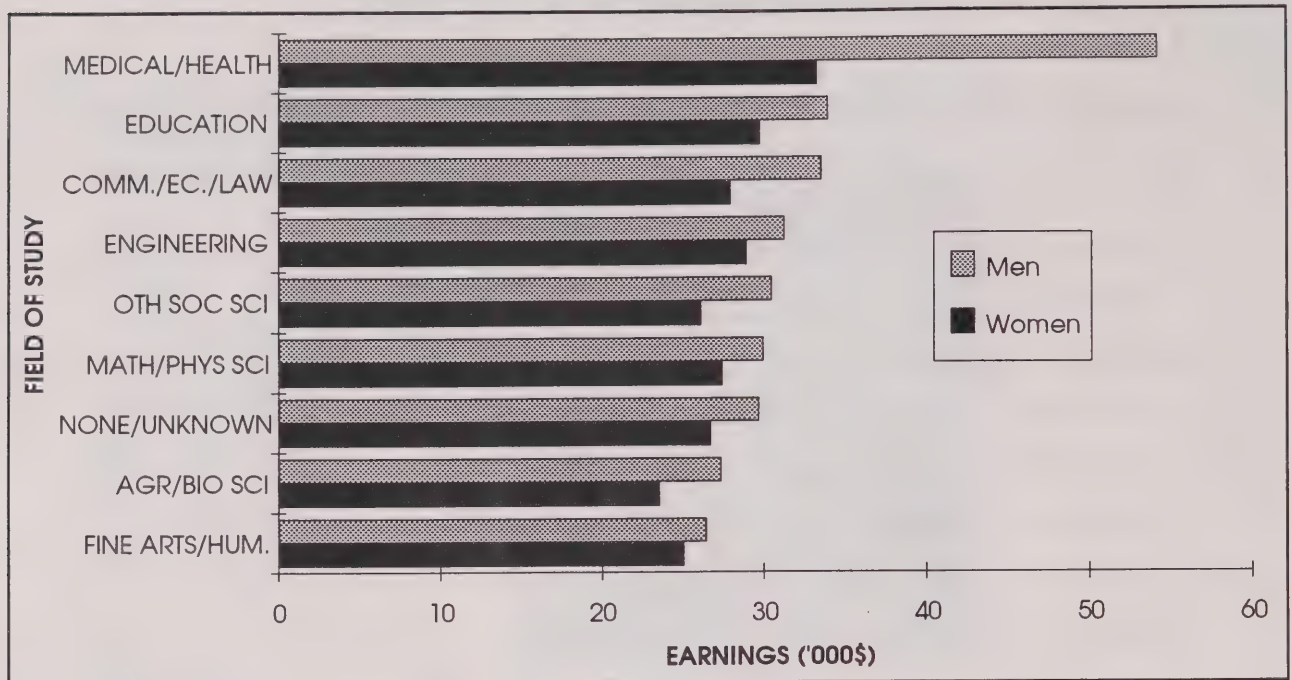


CHART A4. UNIVERSITY GRADUATES EARNINGS BY FIELD OF STUDY (1991)

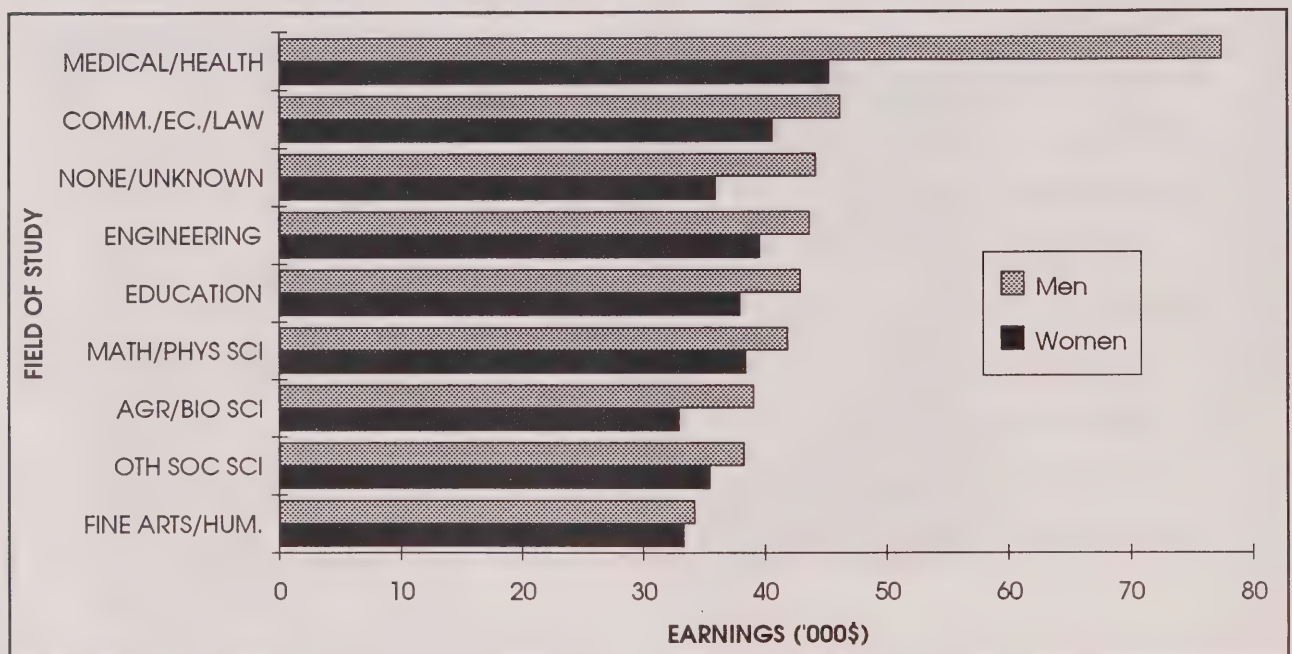


CHART A5 . UNIVERSITY GRADUATES EARNINGS BY FIELD OF STUDY (1992)

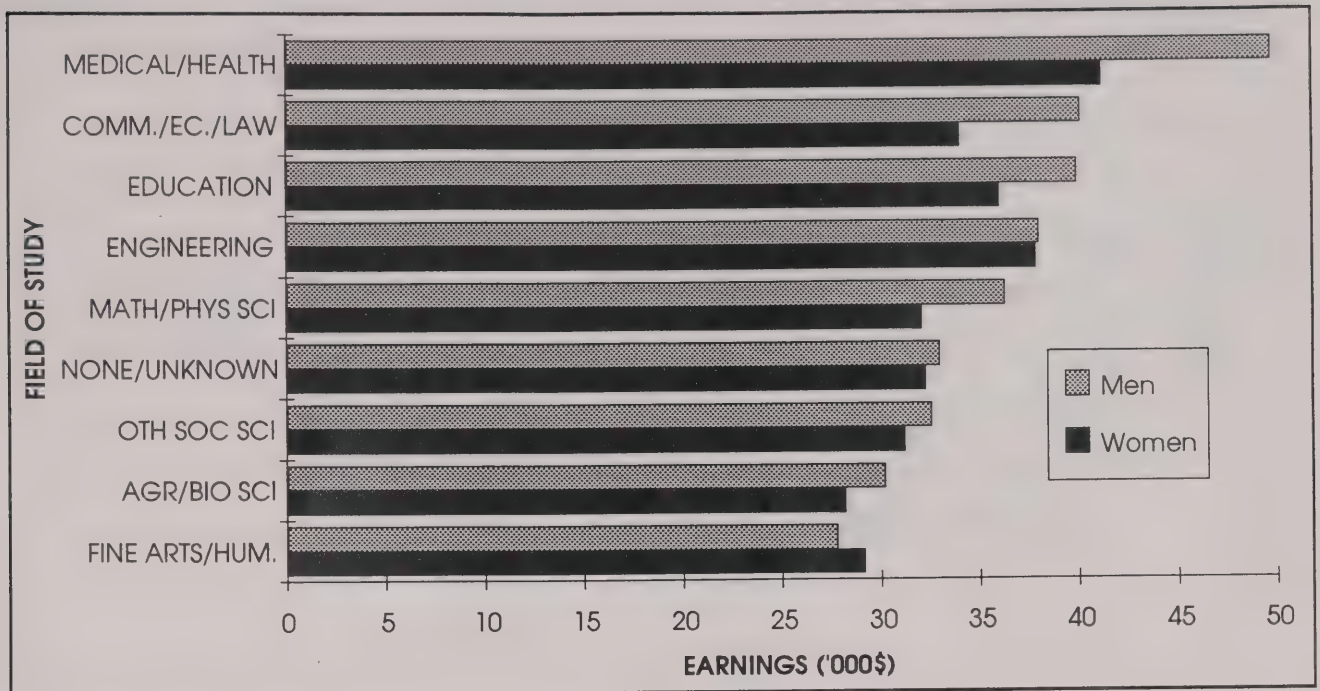


CHART A6. COLLEGE GRADUATES EARNINGS BY FIELD OF STUDY (1984)

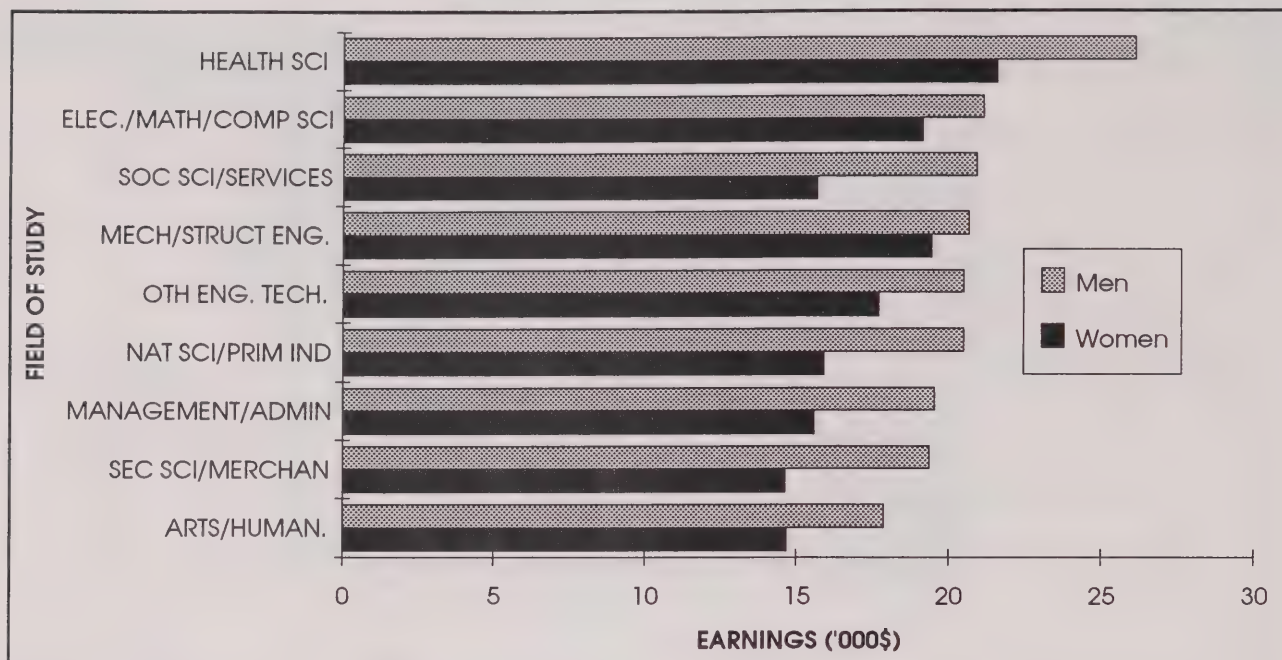


CHART A7. COLLEGE GRADUATES EARNINGS BY FIELD OF STUDY (1987)

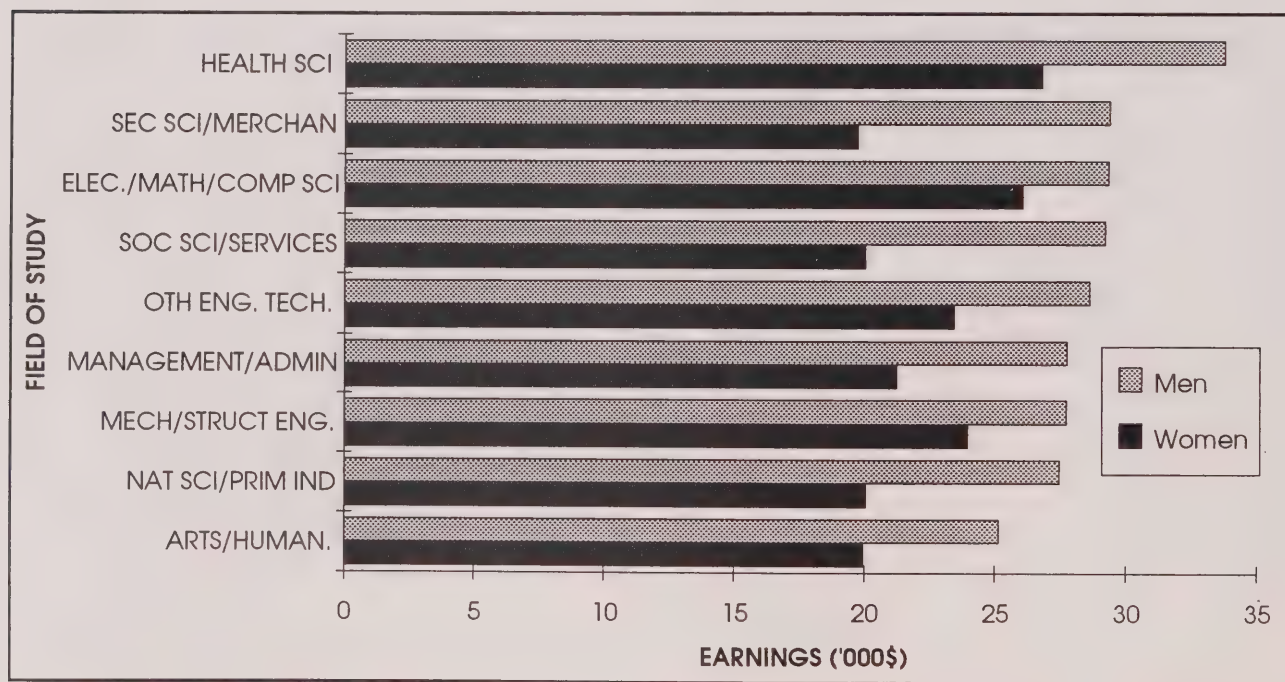


CHART A8. COLLEGE GRADUATES EARNINGS BY FIELD OF STUDY (1988)

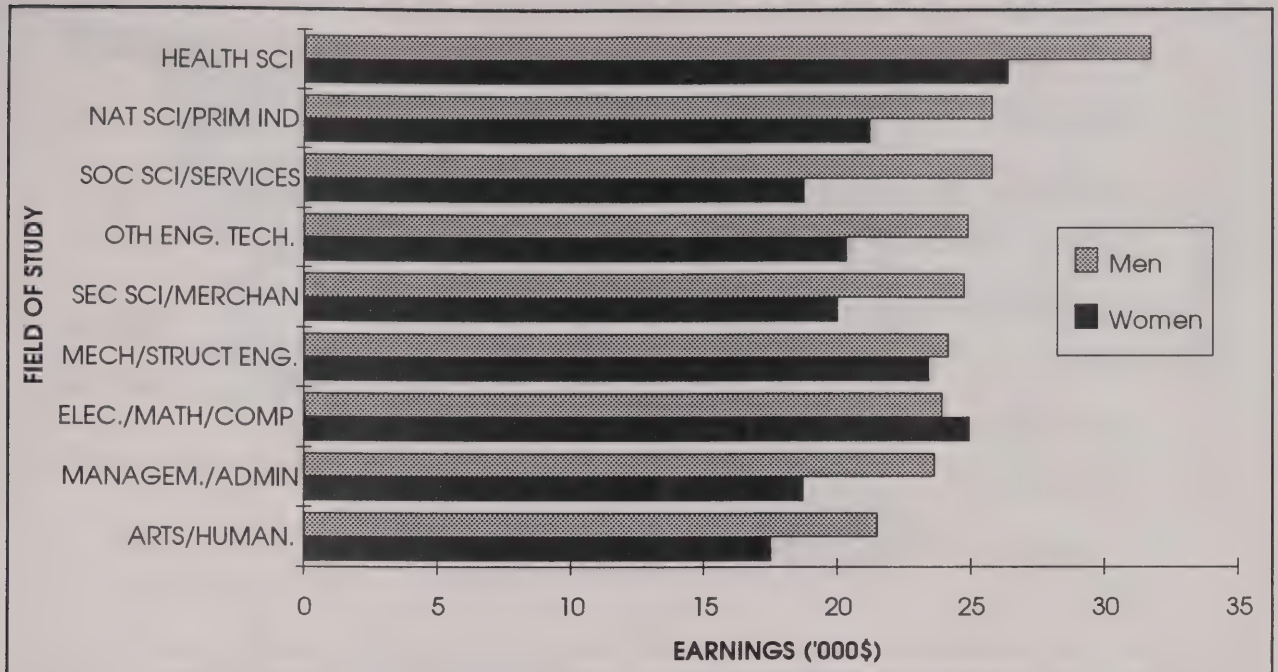


CHART A9. COLLEGE GRADUATES EARNINGS BY FIELD OF STUDY (1991)

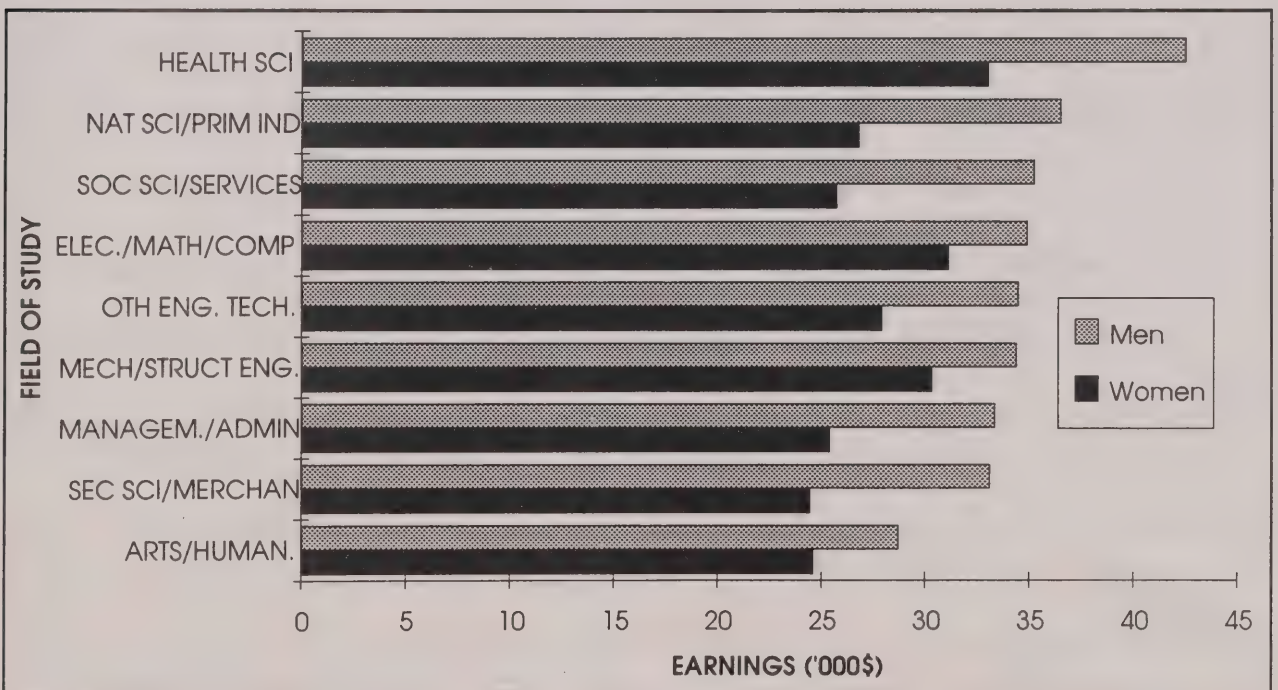
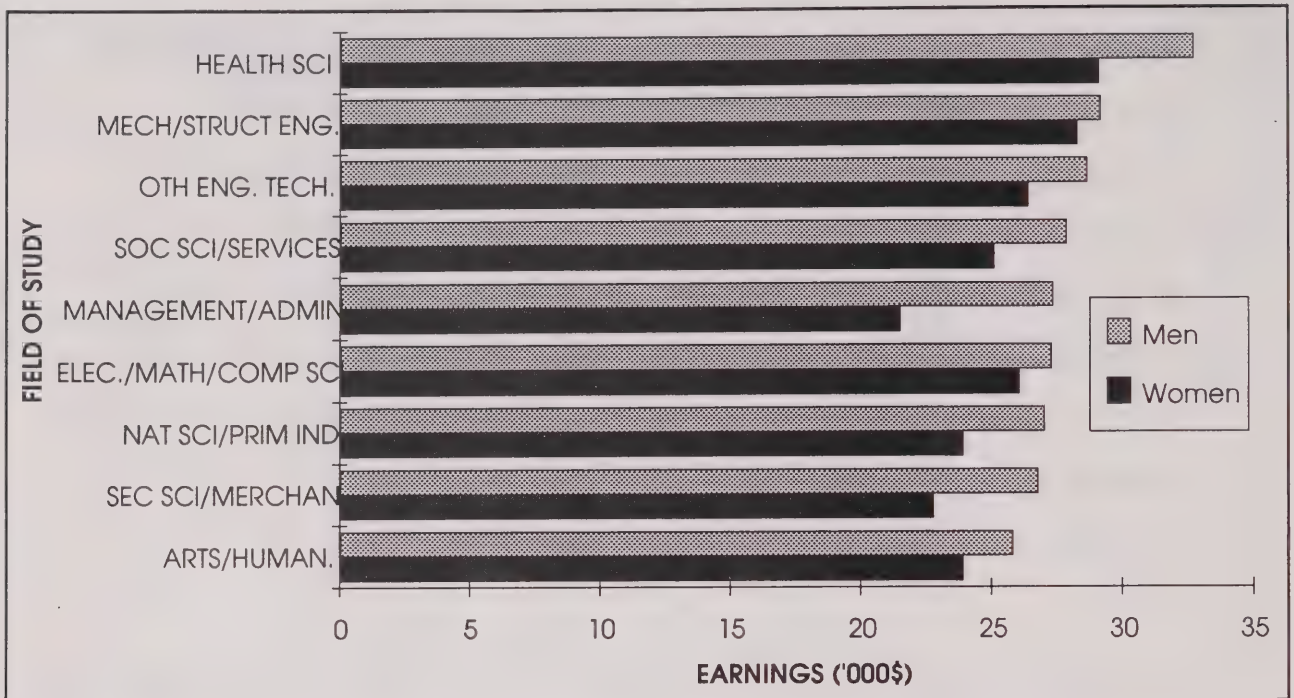


CHART A10. COLLEGE GRADUATES EARNINGS BY FIELD OF STUDY (1992)



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